

IN THE APPLICATION

OF

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FOR A

FORM BRACING TIE BRACKET FOR MODULAR  
INSULATING CONCRETE FORM SYSTEM AND FORM USING THE SAME

Country	Year	Population (millions)	Urban population (millions)	Urban population (%)	Population density (per sq km)	Urban population density (per sq km)	Population growth rate (%)	Urban population growth rate (%)	Population growth rate (%)	Urban population growth rate (%)	Population growth rate (%)	Urban population growth rate (%)
Algeria	1980	10.0	4.0	40.0	100	250	1.5	2.5	1.5	2.5	1.5	2.5
Algeria	1985	10.5	4.5	42.9	105	262.5	1.8	3.0	1.8	3.0	1.8	3.0
Algeria	1990	11.0	5.0	45.5	110	275	2.0	3.5	2.0	3.5	2.0	3.5
Algeria	1995	11.5	5.5	47.8	115	287.5	2.2	4.0	2.2	4.0	2.2	4.0
Algeria	2000	12.0	6.0	50.0	120	300	2.5	4.5	2.5	4.5	2.5	4.5
Algeria	2005	12.5	6.5	52.0	125	312.5	2.8	5.0	2.8	5.0	2.8	5.0
Algeria	2010	13.0	7.0	53.8	130	325	3.0	5.5	3.0	5.5	3.0	5.5
Algeria	2015	13.5	7.5	55.6	135	337.5	3.2	6.0	3.2	6.0	3.2	6.0
Algeria	2020	14.0	8.0	57.1	140	350	3.5	6.5	3.5	6.5	3.5	6.5
Algeria	2025	14.5	8.5	58.6	145	362.5	3.8	7.0	3.8	7.0	3.8	7.0
Algeria	2030	15.0	9.0	60.0	150	375	4.0	7.5	4.0	7.5	4.0	7.5
Algeria	2035	15.5	9.5	61.3	155	387.5	4.2	8.0	4.2	8.0	4.2	8.0
Algeria	2040	16.0	10.0	62.5	160	400	4.5	8.5	4.5	8.5	4.5	8.5
Algeria	2045	16.5	10.5	63.6	165	412.5	4.8	9.0	4.8	9.0	4.8	9.0
Algeria	2050	17.0	11.0	64.7	170	425	5.0	9.5	5.0	9.5	5.0	9.5
Algeria	2055	17.5	11.5	65.7	175	437.5	5.2	10.0	5.2	10.0	5.2	10.0
Algeria	2060	18.0	12.0	66.7	180	450	5.5	10.5	5.5	10.5	5.5	10.5
Algeria	2065	18.5	12.5	67.6	185	462.5	5.8	11.0	5.8	11.0	5.8	11.0
Algeria	2070	19.0	13.0	68.4	190	475	6.0	11.5	6.0	11.5	6.0	11.5
Algeria	2075	19.5	13.5	69.2	195	487.5	6.2	12.0	6.2	12.0	6.2	12.0
Algeria	2080	20.0	14.0	70.0	200	500	6.5	12.5	6.5	12.5	6.5	12.5
Algeria	2085	20.5	14.5	70.7	205	512.5	6.8	13.0	6.8	13.0	6.8	13.0
Algeria	2090	21.0	15.0	71.4	210	525	7.0	13.5	7.0	13.5	7.0	13.5
Algeria	2095	21.5	15.5	72.1	215	537.5	7.2	14.0	7.2	14.0	7.2	14.0
Algeria	2100	22.0	16.0	72.7	220	550	7.5	14.5	7.5	14.5	7.5	14.5
Algeria	2105	22.5	16.5	73.3	225	562.5	7.8	15.0	7.8	15.0	7.8	15.0
Algeria	2110	23.0	17.0	73.9	230	575	8.0	15.5	8.0	15.5	8.0	15.5
Algeria	2115	23.5	17.5	74.5	235	587.5	8.2	16.0	8.2	16.0	8.2	16.0
Algeria	2120	24.0	18.0	75.0	240	600	8.5	16.5	8.5	16.5	8.5	16.5
Algeria	2125	24.5	18.5	75.5	245	612.5	8.8	17.0	8.8	17.0	8.8	17.0
Algeria	2130	25.0	19.0									

1. The first step is to identify the problem.

## 2. DESCRIPTION OF THE PRIOR ART

Left-in-place insulting concrete forms for building walls from poured concrete are known. In commercial practice, courses of forms are stacked until the final desired height of a wall is attained. Concrete is poured into the erected forms and allowed to cure. Erection of multi-course forms prior to pouring concrete must be carefully performed. It is necessary that the forms be properly aligned with respect to one another to assure that finished wall surfaces are flat and flush. Also, opposing exterior panels of each form section must be held in place without distortion of overall configuration of the form.

Tie brackets spanning inner and outer opposing panels of each section for providing support to the opposing panels of a form are known. However, most prior art tie brackets are designed with narrow focus on the immediate function of stabilizing a form. Ancillary functions, such as expediting assembly of the form and supporting elements of plumbing, power, and communications systems of the completed structure, are not provided for in known prior art tie brackets.

United States Patent Number 4,730,422, issued to David A. Young on March 15, 1988, shows a tie for supporting and bracing panels of a left-in-place form. The tie has spaced apart parallel end plates and a spanning web. The web  
5 includes two open areas and four short projections for retaining reinforcing rods. However, the tie of Young cannot accommodate plumbing and electrical elements as can the novel tie bracket, and is not conducive to being sawed horizontally in half, both being characteristics of the present invention.

10 United States Patent Number 5,459,971, issued to Alan Sparkman on October 24, 1995, shows a tie for concrete forms which tie, despite its several interior openings, cannot accommodate placement of plumbing and electrical elements from the side as can the novel tie bracket. The tie of Sparkman is  
15 not conducive to being sawed horizontally in half in the manner of the novel tie bracket.

United States Patent Number 5,845,449, issued to Jamieson R. Vaughan et al. on December 8, 1998, shows a tie for a concrete forming system. The subject tie includes many  
20 interior openings, but these openings lack the proportions and dimensions which enable the novel tie bracket to be highly compatible with plumbing and electrical elements, interfitting

notches and projections which enable vertically stacked forms to be advantageously aligned, and to be sawed horizontally.

None of the above inventions and patents, taken either singly or in combination, is seen to describe the instant invention as claimed.

#### SUMMARY OF THE INVENTION

The present invention sets forth a tie bracket for connecting and bracing opposed insulation panels of an insulating concrete form system, and forms incorporating the same. The tie bracket includes opposed, spaced apart parallel plates spanned by structural connecting members. The connecting members comprise horizontal and vertical webs imparting great strength to the connecting members while requiring minimal constituent material. The plates form structural studs embedded in each insulation panel of the form. The plates are full height in that they extend the same vertical distance as the expanded foam insulating panel.

An important characteristic of the novel tie bracket is that it accommodates elements of electrical, heating, ventilating, air conditioning, and plumbing systems which may

be installed in the building. To this end, the tie bracket has interior openings for accommodating reinforcing bars, electrical cables, and plumbing and heating, ventilating and air conditioning conduits passed therethrough. Several  
5 openings are dimensioned and configured to cooperate with standard electrical work boxes installed in the wall built using the insulating forms. An upwardly open retainer or saddle accommodates vertically stacked, horizontally laid reinforcing bars. This feature enables reinforcement bars to  
10 be spliced and still closely received within the saddle. One series of adjacent openings accommodates horizontal sawing of the tie bracket and an associated form incorporating two expanded foam insulating panels connected by the bracket. Additional openings are provided for tying off tether lines  
15 for scaffolding, bracing, and reinforcement bars.

Another significant feature of the form is that it enables succeeding courses to be aligned vertically. To this end, castellations are formed in the top surfaces of the forms, with corresponding notches formed in the lower  
20 surfaces.

Accordingly, it is one object of the invention to provide a tie bracket for connecting and bracing opposing panels of an insulating concrete form system.

It is another object of the invention that the tie  
5 bracket and associated insulating concrete form accommodate elements of electrical, plumbing, heating, ventilating, and air conditioning systems.

It is a further object of the invention to enable the tie  
10 bracket and its associated insulating concrete form to be horizontally sawed in half without diminishing structural integrity of the remaining portions of the tie bracket.

Still another object of the invention is to provide a saddle enabling plural reinforcing bars to be laid one above the other on and retained by the tie bracket.

15 An additional object of the invention is to provide additional openings for accommodating tethers for scaffolding, bracing, and reinforcement bars.

Yet a further object of the invention is to promote vertical alignment of stacked forms.

It is an object of the invention to provide improved elements and arrangements thereof in an apparatus for the purposes described which is inexpensive, dependable and fully effective in accomplishing its intended purposes.

5           These and other objects of the present invention will become readily apparent upon further review of the following specification and drawings.



## BRIEF DESCRIPTION OF THE DRAWINGS

Various other objects, features, and attendant advantages of the present invention will become more fully appreciated as the same becomes better understood when considered in conjunction with the accompanying drawings, in which like reference characters designate the same or similar parts throughout the several views, and wherein:

Fig. 1 is a perspective view of one embodiment of a wall tie bracket according to the present invention.

Fig. 2 is a cross sectional detail view taken along line 2-2 of Fig. 1.

Fig. 3 is a partially exploded perspective view of one embodiment of a form incorporating wall tie brackets of the type shown in Fig. 1.

Fig. 4 is a diagrammatic, side elevational view of three forms of the embodiment of Fig. 3, shown interlockingly assembled.

## DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 of the drawings shows a wall tie bracket 10 according to the present invention. Tie bracket 10 comprises a first elongate plate 12, a second elongate plate 14 spaced apart from plate 12, and a web 16 securing plates 12, 14 in spaced apart relation. Web 16 includes a plurality of vertically spaced apart spanning members 18, 20, 22, 24 which extend horizontally, in the depiction of Fig. 1, from plate 12 to plate 14, to join plates 12 and 14 structurally. Spanning members 18, 20, 22, 24 are connected to one another by braces 26, 28. Spanning members 18, 20, 22, 24 and braces 26, 28 are preferably formed by intersecting straps selectively orthogonally oriented to one another, as shown in Fig. 2. This cross sectional configuration maximizes strength of the respective member while minimizing the amount of constituent material thereof. Circumferentially closed openings are thus formed in web 16.

At least two horizontal rows of circumferentially closed openings are formed when plates 12, 14 are oriented vertically, as shown in Fig. 1, there being at least two adjacent openings in each horizontal row. The arrangement of openings between horizontal and vertical members results in a

very useful array of openings. First, it will be seen that outer openings 30, 36 and inner or central openings 32, 34, all formed between spanning members 20, 22, are oriented such that their lengths extend horizontally. As a consequence, with their center lines arranged in line, it is easy for a mechanic to saw through tie bracket 10 horizontally without diminishing structural integrity of either remaining section of the tie bracket and of the entire form module. This must occasionally be done to create a form half the height of the uncut form to limit form height to the desired height of a finished wall. Furthermore, location of end openings 30, 36 where they terminate respectively at plates 12, 14 creates convenient electrical cable and conduit chases. To protect cables, openings 30, 36 are bounded by horizontally oriented straps. That is, the width of the strap is parallel to at least one, and preferably both, of plates 12, 14. It will be seen that outer openings 30, 36 each has a height greater than that of central openings 32, 34. The extra height of openings 30, 36 accommodates plural cables and conduits, whereas central openings 32, 34 require only nominal height for accommodating a saw blade. Openings 45, 47 are each dimensioned and configured to receive an electrical work box (not shown) which may be installed by sawing away an appropriate portion of plate 12 or 14.

Uppermost spanning member 18 has an upwardly open receptacle 38 for receiving reinforcing bars (not shown). The height of receptacle 38 is greater than the width, so that two sections of reinforcing bars can be laid in receptacle 38 and supported in overlying, overlapping relationship to facilitate splicing. Uppermost spanning member 18 also has a small circumferentially closed openings 40, 42 located above spanning member 18. Openings 40, 42, and 43 accommodate tie wires and tethers for scaffolding (not shown), bracing (not shown), and general purpose securement to tie bracket 10 and larger elements such as plumbing and HVAC conduits. Lowermost spanning member 24 similarly has two openings 44, 46 formed therein.

Referring now to Fig. 3, the principal function of tie bracket 10 is to connect opposing insulating panels 48, 50 of insulating concrete forms for the purpose of holding panels 48, 50. Panel 48 is an insulating panel preferably formed from expanded foam. Panel 50 is a second insulating panel formed from expanded foam, and is located on the opposed side of the final form 52 comprising panels 48 and 50 and a plurality of tie brackets 10. Tie brackets 10 span and connect panels 48 and 50. Panels 48 and 50 are dimensioned and configured such that the height of each plate 12 or 14

(see Fig. 1) of the various tie brackets 10 are equal to the height of each panel 48 or 50. This characteristic improves vertical load bearing strength of the form.

Form 52 is dimensioned and configured so that as  
5 succeeding courses of forms 52 are formed by stacking forms 52  
on one another, they interlock with one another. This  
characteristic is enabled by cooperating projections 60, 62,  
64 and notches 68, 70, 72. Upper surface 58 of panel 48 has a  
plurality of inward projections 60, 62, 64 formed therein.  
10 Panel 50 is essentially a mirror image of panel 48, so that  
description set forth regarding panel 48 will be understood to  
apply equally to panel 50. Lower surface 66 of panel 48 bears  
notches 68, 70, 72 corresponding to projections 60, 62, 64.  
Each notch 68, 70, or 72 is dimensioned and configured to  
15 receive one projection 60, 62, or 64 of another form 52 in  
close cooperation therewith such that a form 52 placed above  
can interlock with a form 52 located below when pressed into  
mutual engagement. To this end, notches 68, 70, 72 are  
located directly below respective projections 60, 62, 64.

20 Location and spacing of projections 60, 62, and 64 and,  
of course, corresponding notches 68, 70, 72 are arranged to  
enable both direct vertical registry of forms 52 when stacked,

and also overlapping relationship. This is accomplished by spacing apart adjacent projections 60, 62, 64 and corresponding notches 68, 70, 72 at regularly occurring intervals 74, 76. Notches 68, 72 may be said to be end notches since each is the last notch on its respective end of panel 48, and is adjacent to only one other notch (namely, notch 70). Panel 48 has a first end 82 and a second end 84.

The present invention is susceptible to variations and modifications which may be introduced thereto without departing from the inventive concept. Illustratively, there is no necessity that projections 60, 62, 64 be inwardly directed. They could be outwardly, upwardly, or otherwise directed if desired as long as they accommodate interlocking as described herein.

It is to be understood that the present invention is not limited to the embodiments described above, but encompasses any and all embodiments within the scope of the following claims.